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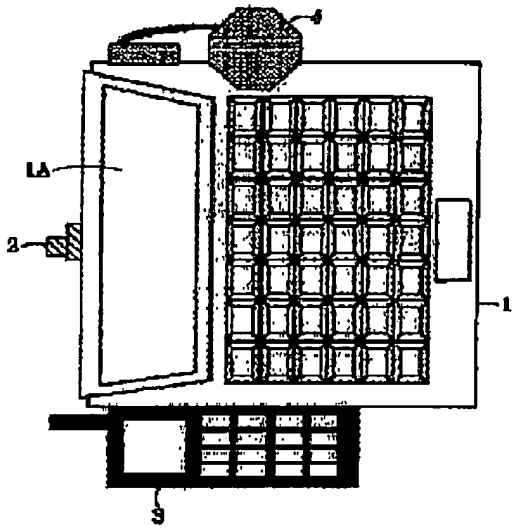
TITLE : TERMINAL DEVICE



ABSTRACT : PROBLEM TO BE SOLVED: To obtain the terminal device in which the information based on the position of the terminal is superimposed and displayed on the present picture being displayed on a screen.

SOLUTION: A video inputting TV camera 2, a global positioning system antenna for position data determination 4 and a transmitter-receiver 3 are provided to a portable personal computer 1. Moreover, a database is provided in the hard disk of the terminal. The present position information of the terminal, which is obtained through the antenna 4 by a control means, is made as a retrieving key and related information is obtained from the database and the information is superimposed on the picture and displayed.

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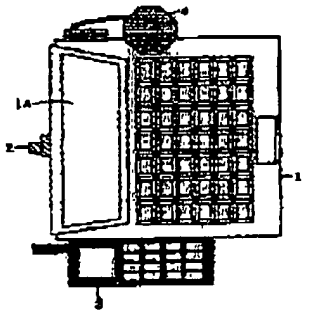
(54) [Title of the Invention] Terminal device

(57) [Abstract]
[Problem] To produce a terminal device in which information based on position is superimpose-displayed on a current image displayed on a screen.
[Solving Means] A terminal device characterized by the ancillary-attachment of an image inputting Television camera 2, a global positioning system antenna for position data acquisition 4 and a communication transmitter-receiver device 3 to a portable personal computer 1 and, furthermore, by a configuration in which a database is held in the hard disk of the terminal and in which, using a control means, current position information of the terminal device acquired by the employment of the abovementioned antenna is used as a search key to acquire related information from the database which is superimposed and displayed on the picture image.



1 Portable personal computer
2 Image inputting Television camera
3 Communication transmitter-receiver
4 GPS antenna for position data acquisition

[Scope of the Patent Claims]

[Claim 1] Terminal device, characterized by the ancillary-attachment of an image inputting Television camera, a global positioning system antenna for position data acquisition and a communication transmitter-receiver device to a portable personal computer and, furthermore, by the provision of a database held in the hard disk of the terminal device and a control means which displays the picture image input from the abovementioned image inputting Television camera on the terminal device image of a display part of the abovementioned personal computer and, using the current position information of the terminal device acquired by the employment of the abovementioned global positioning system antenna as a search key, acquires related information from the abovementioned database and superimposes and displays this on the abovementioned picture image.

[Claim 2] Terminal device according to Claim 1, characterized in that the control means selects and displays one or two or more sets of information from among near-range information that denotes current position, mid-range information that denotes slightly more distant information, and far-range information that denotes remote information.

[Detailed Description of the Invention]

[0001]

[Field of Industrial Utilization] The present invention constitutes a technique that relates to a terminal device that is portable and can be moved, that is to say, to a mobile terminal device and, furthermore, to a technique that relates to a method of display on this mobile terminal device.

[0002] Moreover, the invention relates not to personal computers used in fixed positions such as in offices but rather to personal computers that are used at a point of destination or while moving.

[0003]

[Prior Art] Although portable terminal devices are available in the prior art, because position and time and so on cannot be automatically acquired using these terminal devices when they are to be recorded, this information must be input by the individual.

[0004] In addition, although devices are available that connect communication devices to Television cameras or still cameras and, although these devices are capable of sending picture images acquired at the transmission side to the other side by way of a network circuit, ancillary information such as the position at the time the images were taken must be sent separately. This information, even at the transmission side, cannot be recorded and held.

[0005] Furthermore, although television conference systems for which desktop computers are employed are also available, because these systems are premised on the employment of a location of use thereof that is fixed, similarly to the above-noted Television camera transmission devices, ancillary information such as position is not held by the transmission side and, without the necessity for said, cannot be transmitted either.

[0006]

[Means to Solve the Problems] As the terminal technologies of the prior art described above do not comprise a means for the acquisition of current position data, information based on position data cannot be displayed on a free terminal device. In addition, because position data cannot

be sent to the point of communication, display information based on position data cannot be displayed at the reception side.

[0007] As display based on position of a terminal device cannot be performed, there is no method by which, even for superimposed-display on a screen, information relating to current images input from a Television camera can be displayed.

[0008] The objective of the present invention, which resolves the problem of communication of the geographical position of the free terminal device to the transmission-side terminal device, is to provide a terminal device able to superimpose-display information based on position on to a current image displayed on a screen.

[0009]

[Means to Solve the Problems] The principal characterizing feature of the present invention is that a Television camera and position data acquisition device (global positioning system) are connected to a portable mobile terminal device, and that information related thereto is superimposed on an image input from the Television camera and displayed on the screen.

[0010] This differs from the technique of the prior art in that the image and position data are simultaneously acquired, and in that information based on the acquired image and position data are simultaneously displayed on the terminal device.

[0011]

[Embodiment of the Invention]

[First Embodiment] A detailed description of a first embodiment (corresponds to Claim 1) is given below with reference to the diagrams.

[0012] Figure 1 is a schematic diagram of a terminal device pertaining to the present invention. The symbol 1 in the diagram denotes a portable personal computer and the symbol 1A denotes a display part thereof. The symbol 2 denotes an image inputting Television camera and the symbol 3 denotes a communication transmitter-receiver. The symbol 4 denotes a position data acquisition global positioning system (hereafter referred to as GPS) antenna. It should be noted that, as the function of a GPS antenna itself is well known, the description thereof has been omitted.

[0013] Figure 2 shows the process flow that follows data input. A description will be given of the terminal device of Figure 1 with reference to this process flow. By means of an image display function of the terminal device, an unaltered display 22 of image data 14 input from the image inputting Television camera (hereafter referred to simply as the Television camera) 2 is performed on the display part 1A. In addition, image processing/recognition processing 15 is performed to extract identifying elements from the image and to acquire recognition data 16. An example of recognition data 16 is a subject name. A database (DB) search processing 17 is implemented using the acquired recognition data 16, and a search output 18, which constitutes ancillary information and related information of the subject, is acquired, and a display 22 thereof is performed.

[0014] A DB search processing 20 of position data 19 acquired on the basis of a signal input from the GPS antenna for position data acquisition 4 is implemented to acquire geographical information (names of places and so on) and related information ("near subject" and so on) 21 and a display 22 is performed on the screen. The geographical information/related information 21 can be used as input for the DB search processing 17 for specifying the recognition data 16 and subject, and it can increase the accuracy of the search output 18 acquired thereafter.

[0015] A DB search · conversion processing 12 is implemented on the basis of the contents of reception data 11 acquired by the communication transmitter-receiver 3 to acquire search output · display data 13. Examples of reception data 11 include the transmission-side terminal ID number and geographical information, and examples of the search output and display data 13 acquired by the conversion thereof include the image display adaptor type based on the terminal ID and the display position on the screen. A display 22 of the search output · display data 13 is performed on the reception-side terminal device.

[0016] The display 22 constitutes a display of the subject, and the image data 14, search output 18 and geographical information · related information 21 constitute, without alteration, the subject for transmission 23.

[0017] In addition, a CPU, as the control means for implementing the control described above, is ancillary-attached to the portable personal computer 1, and the display is performed in the display part 1A thereof.

[0018] [Second Embodiment] Next, a description will be given of a second embodiment of the present invention.

[0019] The description provided below pertains to the expansion of the processing contents of the display 22 shown in Figure 2.

[0020] Although the display 22 is performed on the display part 1A of the portable personal computer, this display part 1A, as shown in Figure 3, constitutes a configuration for display that is divided into lower planes 31 for display of image data 14 and upper planes 32 for display of other data. Although, in Figure 3, the bit planes for image display are shown as the lower planes 31 and the bit planes for superimposed-display of other data are displayed as the upper planes 32, this may be reversed.

[0021] The lower planes 31, which constitute the bit planes for image display, are prepared as 1 plane (1 bit, 2 colours) when the image display is monochrome and, when the image display is colour and, depending on the number of colours, are prepared as 8 planes (8 bits, 256 colours) or 24 planes (24 bits, 16,400,000 colours, full colour).

[0022] The representation capacity of the upper planes 32, which constitute the bit planes for superimposed-display, need only be small in number so they are prepared as one to two planes. For the purpose of simplicity of the following description thereof, the number of lower planes 31 shall be taken as 8 and the number of upper planes 32 shall be taken as 1. It should be noted that the planes are theoretical bit planes and the value of these bit planes is superimposed by OAR.

[0023] Figure 4 shows an example of a display 22 in which the lower planes 31 and upper planes 32 are superimposed.

[0024] In Figure 4, images from the Television camera 2 are input · displayed in the lower planes 31 shown in Figure 3, and information display based on position input from the

GPS antenna 4 is input into the upper planes 32 shown in Figure 3 and a display 22 thereof is performed.

[0025] In Figure 4, the buildings and the road shape in the direction of movement of the current position indicate the information display based on position input from the GPS antenna 4.

[0026] Figure 5 shows a display 22 different to Figure 4 (corresponds to Claim 2).

[0027] Although, in Figure 5, near-range information that denotes current position, mid-range information that denotes slightly distant information and far-range information that denotes remote information denote the information displayed in the upper planes 32, either one or two of these three information sets can be selected. It should be noted that, even with a normal display part 1A that does not comprise upper and lower planes 32, 31, a superimposed-display of other data can be performed together with the image display.

[0028] Figure 6 is a flow diagram of the processing that is employed in the embodiments of Figure 4 and Figure 5. It should be noted that the symbols (S1) to (S8) denote the process thereof.

[0029] In processing (S1), images are input from the Television camera 2 and, in processing (S2), these images are displayed unaltered on the lower planes 31.

[0030] Meanwhile, in processing (S3), data reception from the GPS antenna 4 is simultaneously implemented with the input of picture images and, in processing (S4), a position calculation is performed. As a result, latitude and longitude position information can be acquired. In processing (S5), command information such as far-range display and near-range display are received and, in

processing (S6), on the basis of this and previous position information and the latest position information. a search processing from the database is implemented. In processing (S7), the information acquired as a result of this search is used to determine positional arrangement and, in processing (S8), is displayed on the upper planes 32.

[0031] In both processing (S2) and processing (S8) the images displayed on the upper and lower planes 32, 31 are superimposed and can be simultaneously observed by the user.

[0032] Next, a detailed description of the processing contents of processing (S6) and processing (S7) of Figure 6 will be given.

[0033] Figure 7 represents the configuration of the database that constitutes the subject for the processing that is implemented in the processing (S6) of Figure 6 in which position data is used as a key to search for related information.

[0034] Registered subjects in the database are registered with the assigning of position data 1 (latitude information), position data 2 (longitude information) position data 3 (far, mid, near information), subject attributes (road information, building information and so on) and display information (text data and diagrammatical data and so on) respectively.

[0035] A description will be given, with reference to Figure 8, of the processing implemented in the processing (S6) of Figure 6 in which current position data is used as a key to search for related information.

[0036] The following definitions are used in Figure 8.

[0037] The symbol ○ denotes position based on previously acquired position information. In Figure 8 this is denoted as P-1. In addition, the position coordinates are expressed as (x-1, y-1). These may be considered as latitude and longitude respectively.

[0038] The symbol ◎ denotes current position based on the latest position information acquired. In Figure 8 this is denoted as Po. In addition, the position coordinates are expressed as (xo, yo).

[0039] The symbol ● denotes position of the registered subjects - of which there are a plurality. One thereof, as shown in Figure 8, is denoted as Pi, and the position coordinates thereof are expressed as (xi, yi).

[0040] First, a direction of progress vector Vd is calculated from the information described above. When Vd = (xd, yd) then xd=xo-x-1, yd=yo-y-1.

[0041] Here, the following processing is implemented on the individual registered subjects within the database. In the description given below, the processing is described as being implemented on an i^{th} number of registered subjects. In order to implement the processing on all registered subjects the processing should be implemented increasing i from 1 to the final registered subject I.

[0042] 1) First, a vector Vi between the current position Po and the actual position Pi of the subject is calculated.

[0043]

[Equation 1]

When Vi= (xdi, ydi), then

[0044]

[Equation 2]

xdi = xi-xo, ydi=yi-yo

[0045] 2) Next, an angle θ formed between Vd and Vi is calculated.

[0046]

[Equation 3] $\cos\theta = (Vd \cdot Vi)/(|Vd| \cdot |Vi|)$

However,

[0047]

[Equation 4]

$$(Vd \cdot Vi) = xd*xdi + yd*ydi$$

$$|Vd| = \sqrt{xd^2 + yd^2}$$

$$|Vi| = \sqrt{(xdi*xdi + ydi*ydi)}$$

[0048] 3) Here, if the field of view angle established in advance is taken as α and the vector is larger than the value of half this angle, the subject will be deemed not to be within the field of view and the following processing will not be implemented.

[0049] That is to say, if $\theta > \alpha/2$, the following processing is skipped.

[0050] 4) Next, a distance Li, equivalent to the subject distance, is obtained.

[0051]

[Equation 5]

$$Li = |Vi| = \sqrt{(xdi*xdi + ydi*ydi)}$$

5) If Li is larger than the current designated distance range, for example, than the numerical value assigned using the far-range and near-range buttons of Figure 5, this is deemed to be beyond the range of the search subject and the following processing will not be implemented.

[0052] That is to say, if the numerical value assigned by the operation of the user is taken as L1 and Li>L1, the following processing is skipped.

[0053] 6) The registered subjects that remain as a result of this processing are displayed, and the information in the database is transferred to the following display processing.

[0054] A description will be given, with reference to Figure 9, of a method for determining position when information obtained following the search implemented in the processing (S7) of Figure 6 is displayed on the screen.

[0055] The following definitions are used in Figure 9.

[0056] The symbol H denotes the length in the vertical direction, that is to say, the height, of the screen or the window within the screen in which the search results are displayed.

[0057] The symbol L denotes the length in the horizontal direction, that is to say, the width, of the screen or the window within the screen in which these search results are displayed.

[0058] The symbol l'i constitutes the distance to the right side from the centre line of the display screen or the width of the window of the display position of the display information of the registered subject acquired as a search result.

[0059] The symbol h'i constitutes the distance of this display position below the display screen or window. The display positions l'i, h'i are determined by the following procedure.

[0060] 1) The horizontal position is established from the positional relationship between the current position and the search extracted registered subject. That is to say,

[0061]

[Equation 6]

$$L/2 : \sin(\pi/2) = l'i : \sin\theta$$

Accordingly,

[0062]

[Equation 7]

$$l'i = (1/2) \sin \theta$$

2) The vertical position, as one example, is determined by the employment of f(x) of the following relationship:

[0063]

[Equation 8]

$$f(x) = (\pi/2)\arctan(x)$$

That is to say,

[0064]

[Equation 9]

$$h'i = H*f\ (Li)$$

Naturally, it goes without saying that other methods besides this method may be employed for determining position.

[0065]

[Effect of the Invention] As is described above, by virtue of the fact that, in the present invention, a Television camera and position data acquisition device are connected to a mobile terminal device and images input from the Television camera are superimposed with information related thereto and displayed on a screen and, by virtue of the fact that a search processing is implemented on the basis of search location information, an information search more appropriate to the user can be implemented. This is advantageous in that, during searches at this time the user need not be concerned about position.

[0066] In addition, by virtue of the fact that near-range information, mid-range information and far-range

information can be selected and displayed on the screen, the uptake of position information is simplified.

[Brief Description of Diagrams]

[Figure 1] is a diagram that shows the configuration of a first embodiment of a terminal device pertaining to the present invention;

[Figure 2] is a diagram that shows the processing flow following input of the range of data of Figure 1;

[Figure 3] is an explanatory diagram of the configuration of the display part of Figure 1;

[Figure 4] is a diagram that shows a display function summary of the display part of Figure 1;

[Figure 5] is a diagram that shows another display function summary of the display part of Figure 1;

[Figure 6] is a flow diagram for explaining the processing flow of the embodiment of Figure 4 and Figure 5;

[Figure 7] is a diagram for explaining the storage configuration of the database in which position data is used as a key for searching for related information;

[Figure 8] is a diagram for explaining the processing in which the current position is used as a key for extracting registered information from the database; and

[Figure 9] is a diagram for explaining the display position when information acquired following the search processing is displayed on the screen.

[Explanation of Symbols]

1 Portable personal computer

1A Display part

2 Image inputting Television camera

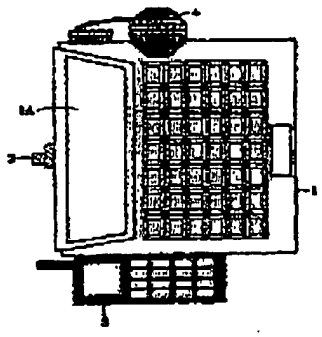
3 Communication transmitter-receiver

4 GPS antenna for position data acquisition

11 Reception data

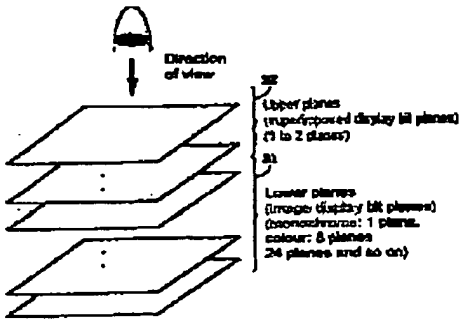
12 DB search/conversion processing
13 Search output/display data
14 Image data
15 Image processing/Recognition processing
16 Recognition data
17 DB search processing
18 Search output
19 Position data
20 DB search processing
21 Geographical information · Related information
22 Display
23 Transmission
31 Lower planes
32 Upper planes

[Figure 1]

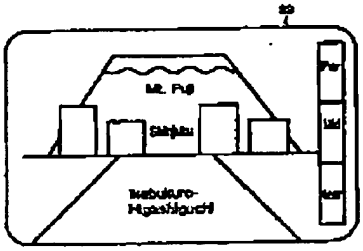


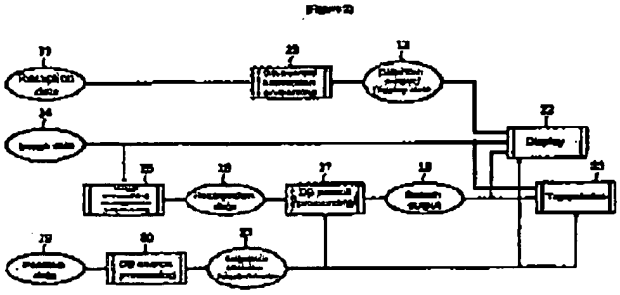
1 Portable personal computer
2 Image inputting Television camera
3 Communication transmitter-receiver
4 GPS antenna for position data acquisition

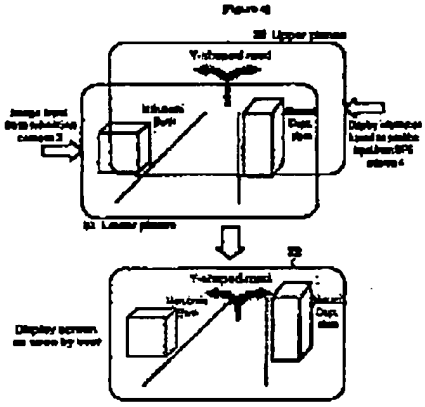
[Figure 3]

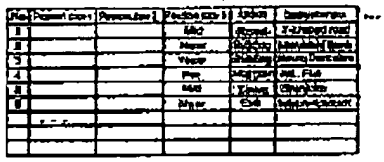


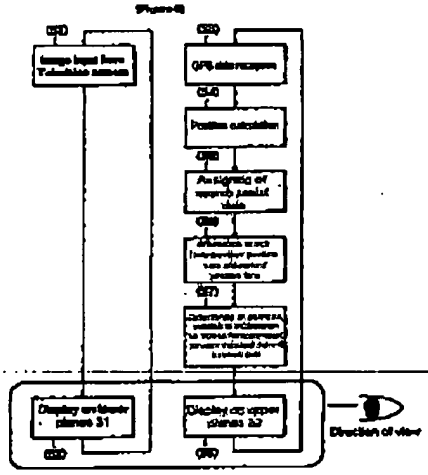
[Figure 5]



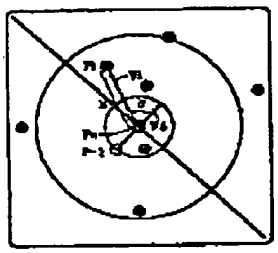






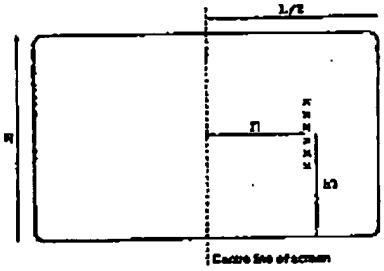


[Figure 8]



O : Previous position, P-1 = (p-1_x, p-1)
Ⓒ : Current position, Pc = (pc, pc)
Ⓢ : Subject location position, P^ subject position Pt = (xt, yt)
Direction of movement vector : Vd = (xd, yd) = (xcnow-1, yc-y-1)
Vector from current position to P^ subject position :
Vt = (xct, yct) = (xtnc, yc-yc)
Angle between Vd and Vt: θ
Distance between Pc and Pt : s

[Figure 9]



Width of display screen (window): L
Height of display screen (window): H
Display position of source of subject:
From centre line of width of screen to right side (
From bottom of screen up (

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